REMARKS

Claims 1, 10, 11, 14, 22, 23, 29, 37, 42, 47-49, and 57 have been amended. Claim 66 has been added. Support for the amendments can be found, for example, at page 5 of the specification. Claims 1, 14, 23, 30, 38, 43, 48, 49, 53, 57, and 66 are independent.

Obviousness-Type Double Patenting Rejections

Claims 1-65 have been rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-31 of U.S. Patent No. 6,322,901 ("the '901 patent") or claims 1-20 of U.S. Patent No. 6,207,229 ("the '229 patent") in view of either Alivisatos et al., U.S. Patent No. 5,537,000 ("Alivisatos") or Kawasaki et al., U.S. Patent No. 6,057,561 ("Kawasaki"). See pages 2-3 of the action mailed September 16, 2003 ("Office Action").

Applicants have discovered a gain medium, a laser, a method of amplifying an optical signal, and a method of forming a laser, all of which include a concentrated solid including a plurality of semiconductor nanocrystals. In the concentrated solid, the plurality of semiconductor nanocrystals are **close-packed.** The nanocrystals have an rms deviation in diameter of less than 15%. In other words, the diameters of the individual nanocrystals are within 15% of the average diameter of the plurality. See claims 1, 14, 23, 30, 38, 43, 48, 49 and 53 and 57. Close-packed nanocrystals are an example of a concentrated solid. See page 2, lines 11-12 of the specification. Close-packed refers to an arrangement of objects that maximizes the number of objects that can fit into a given volume.

Claims 1-31 of the '901 patent are directed to a coated semiconductor nanocrystal capable of light emission. See, for example, claims 1 and 10 of the '901 patent. Claims 1-20 of the '229 patent are directed to methods of preparing a coated nanocrystal capable of light emission. None of these claims teach or suggest a person skilled in the art to form a concentrated solid including a plurality of semiconductor nanocrystals. None of the claims teach or suggest a person skilled in the art to form a concentrated solid in which the nanocrystals are **close-packed**. The disclosure of either the '901 patent or the '229 patent does not teach or suggest a person skilled in the art to use a coated nanocrystal in a gain medium or a laser. Neither Alivisatos nor Kawasaki cures this deficiency.

Alivisatos describes an electroluminescent device having an electron transport layer that includes semiconductor nanocrystals. The device is not a laser, and the electron transport layer is not a gain medium. At column 6, lines 26-30, Alivisatos describes semiconductor nanocrystals in the electron transport layer: "[t]he semiconductor nanocrystals are formed into one or more monolayers by any known technique capable of causing the semiconductor nanocrystal particles to bond, as a monolayer, to the underlying substrate or support material, and then, in subsequent monolayers, to one another." The semiconductor nanocrystals in the monolayers are not close-packed. Furthermore, Alivisatos does not describe the dispersity of the semiconductor nanocrystals in the electroluminescent devices. Alivisatos does not teach, suggest, or motivate a person skilled in the art to form a concentrated solid including a plurality of semiconductor nanocrystals having an rms deviation in diameter of **less than 15%**, the plurality of semiconductor nanocrystals being **close-packed**. Therefore, claims 1-65 are not obvious over the claims of either the '901 patent or the claims of the '229 patent in view of Alivisatos.

Kawasaki describes ZnO nanocrystals of a ZnO thin film. See Kawasaki at, for example, column 5, lines 53-55. In FIG. 2, Kawasaki presents a histogram of size distribution of nanocrystals. According to Kawasaki, "the percent variation of the crystal size is 37%" (FIG. 2 and column 5, lines 62-63). FIG. 5 also presents a histogram of size distribution of nanocrystals, with a variation of 33%. See Kawasaki at FIG. 5 and column 6, lines 18-23. Kawasaki does not teach or suggest nanocrystals having an rms deviation in diameter of less than 15%. Nothing in Kawasaki motivates a person skilled in the art to form a concentrated solid including a plurality of semiconductor nanocrystals having an rms deviation in diameter of **less than 15%**. As discussed above, neither the '901 patent nor the '229 patent provides motivation to form a gain medium or laser with a coated nanocrystal. Claims 1-65 of the present application are not obvious over either the claims of the '901 patent or the claims of the '229 patent in view of Kawasaki.

Applicants request that the rejection under the judicially created doctrine of obviousness-type double patenting be reconsidered and withdrawn.

Rejection Under 35 U.S.C. § 102(b)

Claims 1-5, 9-12, 14-17, 21-25, 28-32, 37-39, 42-44, 47-50, 53-54, 57 and 59-62 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Alivisatos. See pages 3-5 of the Office Action. Claims 1, 14, 23, 30, 38, 43, 48, 49, 53 and 57 are independent.

Applicants have discovered a gain medium, a laser, a method of amplifying an optical signal, and a method of forming a laser that includes a concentrated solid including a plurality of semiconductor nanocrystals. The plurality of semiconductor nanocrystals are **close-packed**, and have an rms deviation in diameter of less than 15%. See independent claims 1, 14, 23, 30, 38, 43, 48, 49, 53 and 57. As discussed above, close-packed nanocrystals are an example of a concentrated solid.

Alivisatos describes electroluminescent devices having an electron transport layer that includes semiconductor nanocrystals. The electron transport layer is not a gain medium, and the device is not a laser. Alivisatos does not describe amplifying an optical signal. Therefore, Alivisatos does not anticipate independent claims 30, 38, 43, 49, or 53, nor the claims that depend from them.

At column 6, lines 26-30, Alivisatos describes semiconductor nanocrystals in the electron transport layer: "[t]he semiconductor nanocrystals are formed into one or more monolayers by any known technique capable of causing the semiconductor nanocrystal particles to bond, as a monolayer, to the underlying substrate or support material, and then, in subsequent monolayers, to one another." The monolayer is a layer one nanocrystal thick. The monolayer is not described as having close-packed nanocrystals. The semiconductor nanocrystals in Alivisatos' monolayers are not close-packed. Furthermore, Alivisatos does not describe the dispersity of the semiconductor nanocrystals in the electroluminescent devices. Alivisatos does not describe a concentrated solid including a plurality of semiconductor nanocrystals having an rms deviation in diameter of **less than 15%**, the plurality of semiconductor nanocrystals being **close-packed**. Therefore, Alivisatos does not anticipate independent claims 1, 14, 23, or 57, nor the claims that depend from them.

Applicants respectfully request that the rejection under 35 U.S.C. § 102(b) be reconsidered and withdrawn.

Rejection under 35 U.S.C. § 102(e)

The Examiner has rejected claims 1, 4, 10, 12-16, 22-24, 29-32, 37-39, 42-44, 47-50, 53-54, 57-59, and 61 under 35 U.S.C. § 102(e) as being anticipated by Kawasaki. See pages 5-7 of the Office Action.

As described above, Applicants have discovered a gain medium, a laser, a method of amplifying an optical signal, and a method of forming a laser that includes a concentrated solid including a plurality of semiconductor nanocrystals, the plurality of semiconductor nanocrystals being close-packed. The nanocrystals can have an rms deviation in diameter of less than 15%.

Kawasaki describes ZnO nanocrystals of a ZnO thin film. See Kawasaki at, for example, column 5, lines 53-55. In FIG. 2, Kawasaki presents a histogram of size distribution of nanocrystals. According to Kawasaki, "the percent variation of the crystal size is 37%" (FIG. 2 and column 5, lines 62-63). FIG. 5 also presents a histogram of size distribution of nanocrystals, with a variation of 33%. See Kawasaki at FIG. 5 and column 6, lines 18-23. Kawasaki does not describe nanocrystals having **an rms deviation in diameter of less than 15%**. Therefore Kawasaki does not anticipate independent claims 1, 14, 23, 48, 49, or 57, nor the claims that depend from them.

Kawasaki does not describe a laser including a concentrated solid including a plurality of semiconductor nanocrystals, the plurality of semiconductor nanocrystals being close-packed and **a cavity or a microcavity** arranged relative to the optical gain medium to provide feedback. Therefore Kawasaki does not anticipate independent claims 30, 38, 43, or 53, nor any of the claims that depend from them.

Applicants respectfully request that the rejection under 35 U.S.C. § 102(e) be reconsidered and withdrawn.

Rejections Under 35 U.S.C. § 103(a)

Claims 33 and 34 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Alivisatos, and as being unpatentable over Kawasaki. See Office Action at pages 7-8. Claims 33 and 34 depend from independent claim 30.

As discussed above, Applicants have discovered a laser that includes a concentrated solid including a plurality of semiconductor nanocrystals, the plurality of semiconductor nanocrystals

being **close-packed**. See independent claim 30. Alivisatos does not describe a laser including close-packed semiconductor nanocrystals having an rms deviation in diameter of less than 15%. Indeed, Alivisatos does not describe a laser of any kind. Nothing in Alivisatos teaches, suggests, or motivates a person skilled in the art to form a laser. Neither does Kawasaki teach, suggest, or motivate a person skilled in the art to form such a laser including a plurality of semiconductor nanocrystals, the plurality of semiconductor nanocrystals being close-packed, and **a cavity or microcavity** arranged relative to the optical gain medium to provide feedback. Claim 30 and the claims that depend from it are patentable over Alivisatos, and over Kawasaki. Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a).

New claim

New claim 66 has been added. Support for this new claim can be found, for example at page 5 of the specification. Claim 66 is patentable over all cited art.

CONCLUSION

Applicants ask that all claims be allowed in view of the amendments to the claims and remarks contained in this reply. A check in the amount of $86 is enclosed for excess claims fees. Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: 12-10-03



Harold H. Fox
Reg. No. 41,498

Fish & Richardson P.C.
1425 K Street, N.W.
11th Floor
Washington, DC 20005-3500
Telephone: (202) 783-5070
Facsimile: (202) 783-2331